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# UK Patent Application

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(54) Anchoring system for a semisubmersible platform and process for precasting said system

(57) An anchoring system of a semisubmersible platform that includes at least one anchor 1, and a mooring line 3 connected at one of its ends to the anchor and at the other end to an anchoring cable 9, 11 which extends up to the surface for connection to the semisubmersible platform 5. The anchoring cable 9, 11 presents along its extent, near its central portion, a triple-connection device 7 which divides the anchoring cable into a main anchoring cable 9 which is stored in the anchoring winch of the platform and a precast anchoring cable 11 which is part of the section precast at the location prior to the arrival of the platform. A floating device 13 is arranged at the surface and connected to said triple-connection device by way of a pendant-line 15.

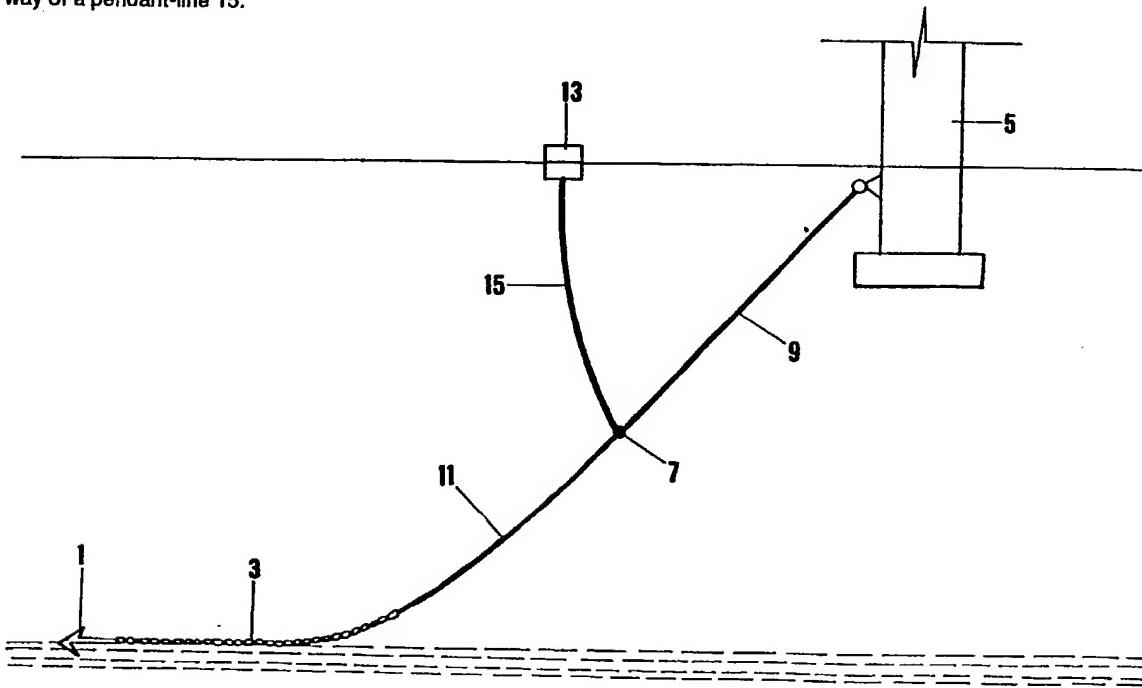
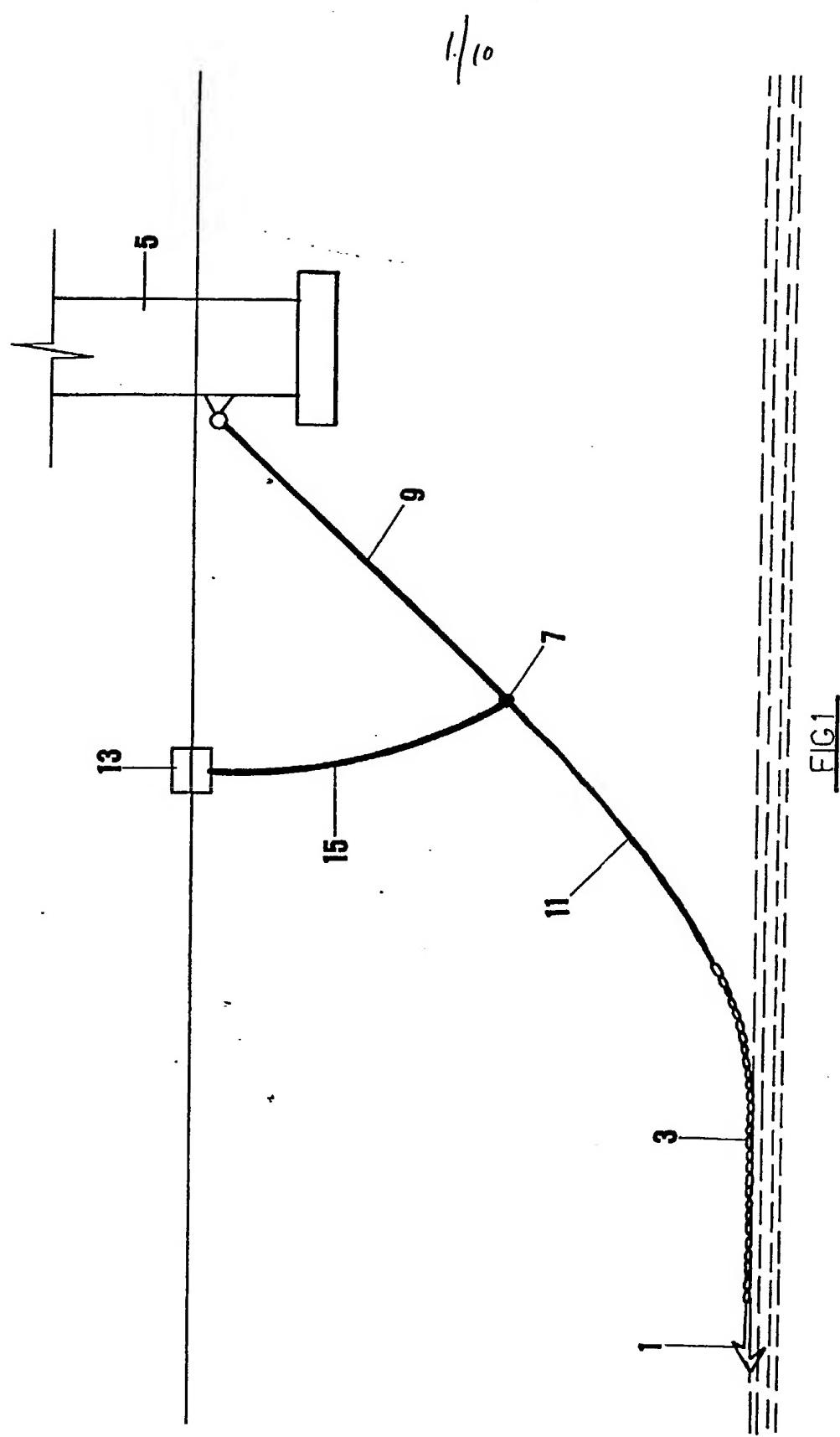
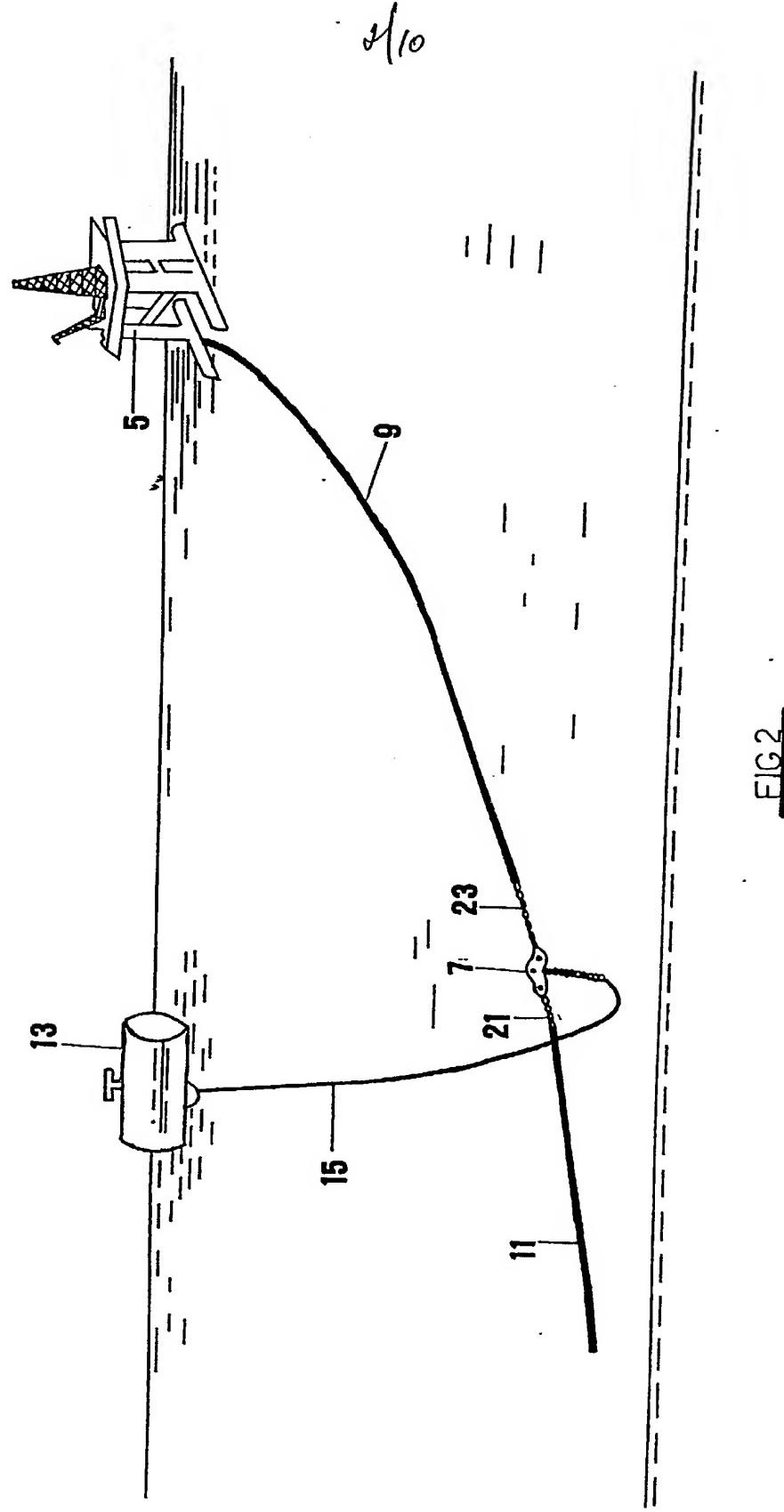


FIG1

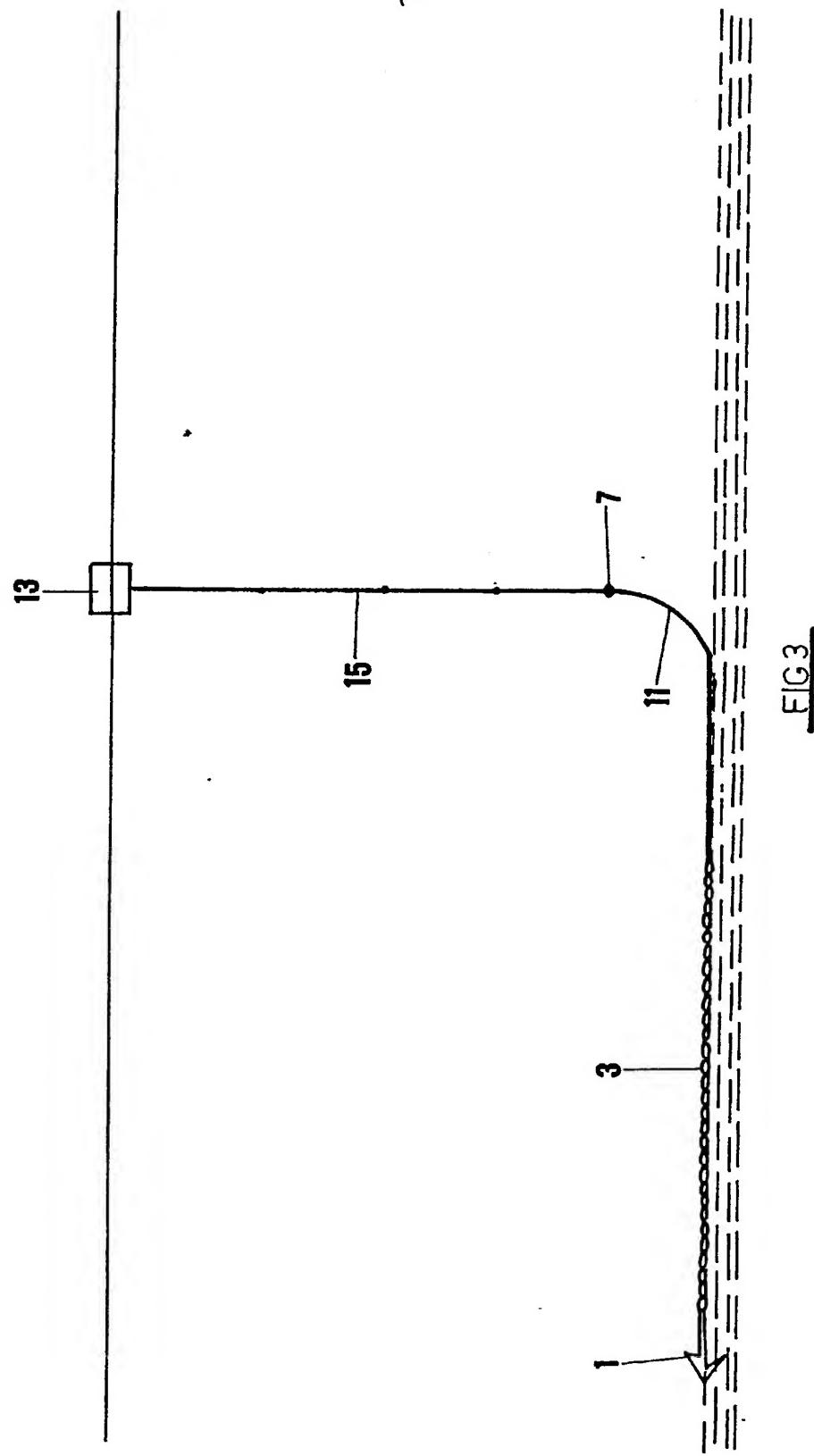
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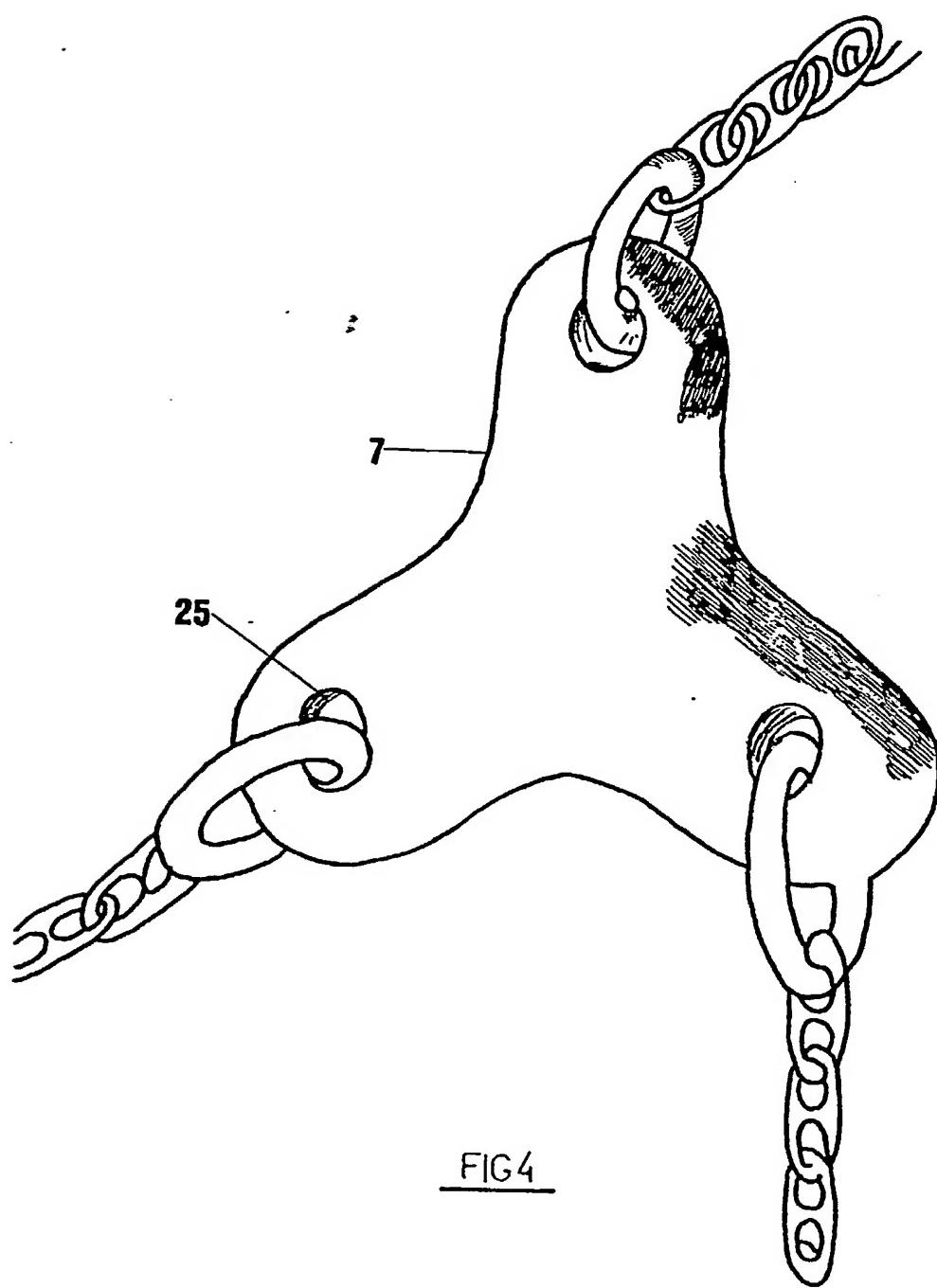


FIG4

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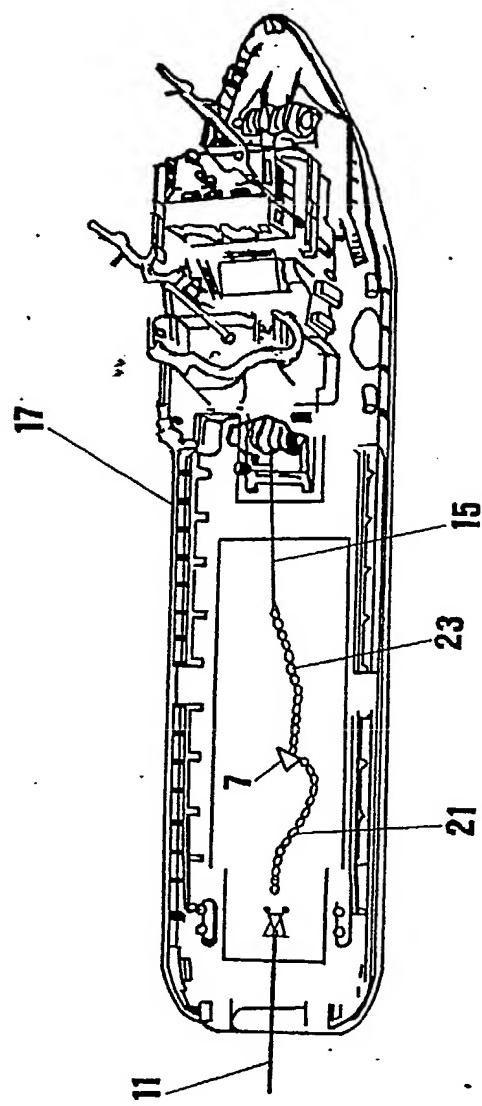
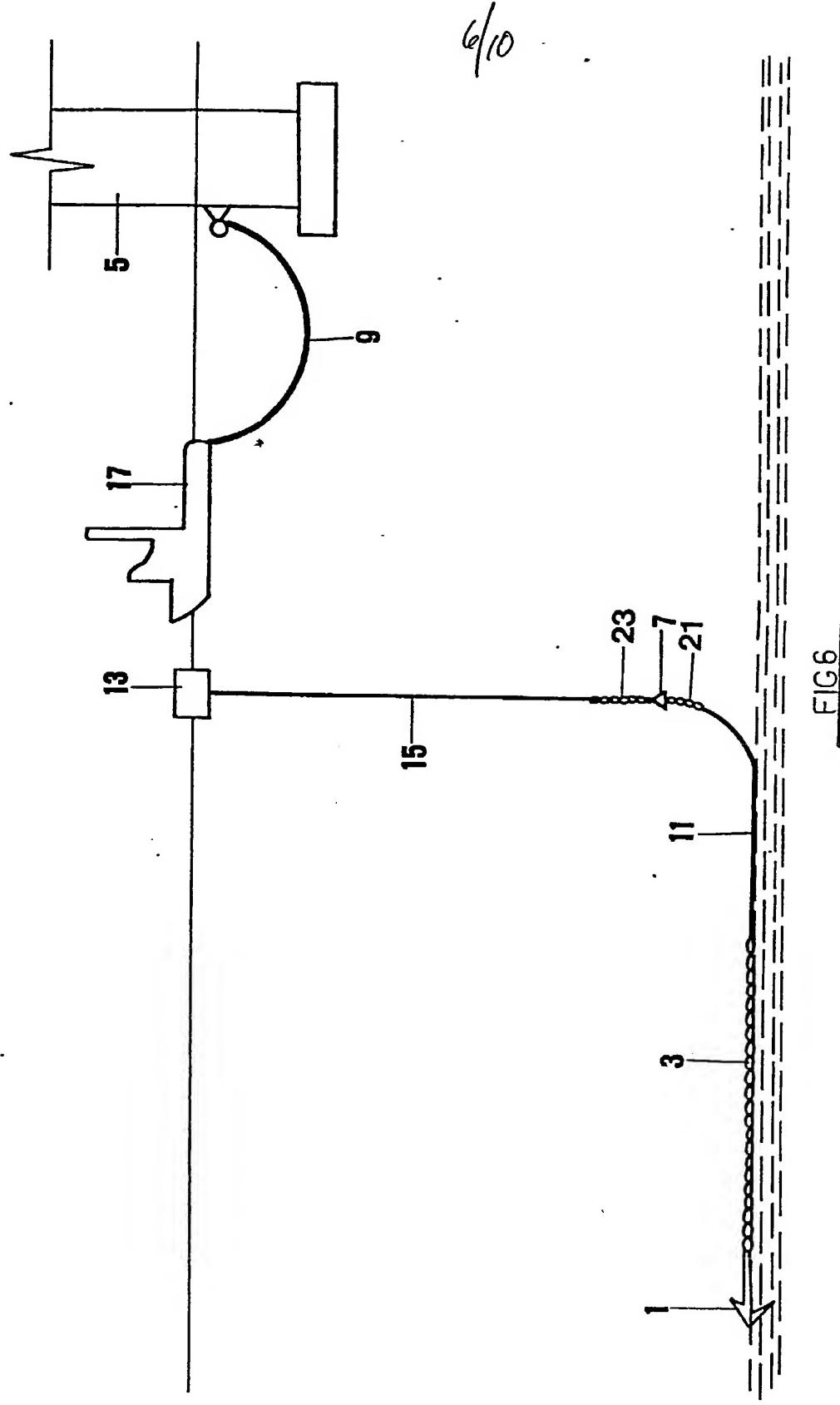


FIG 5



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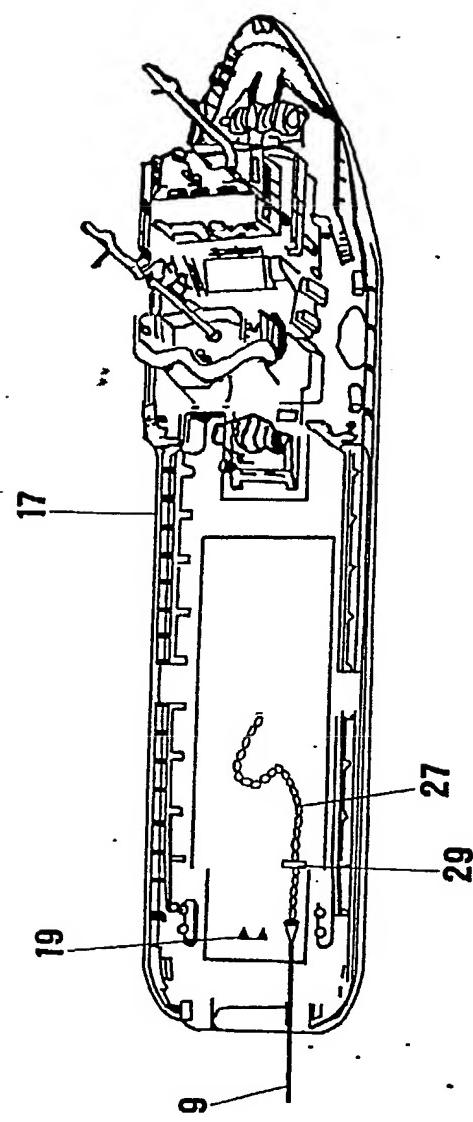


FIG 7

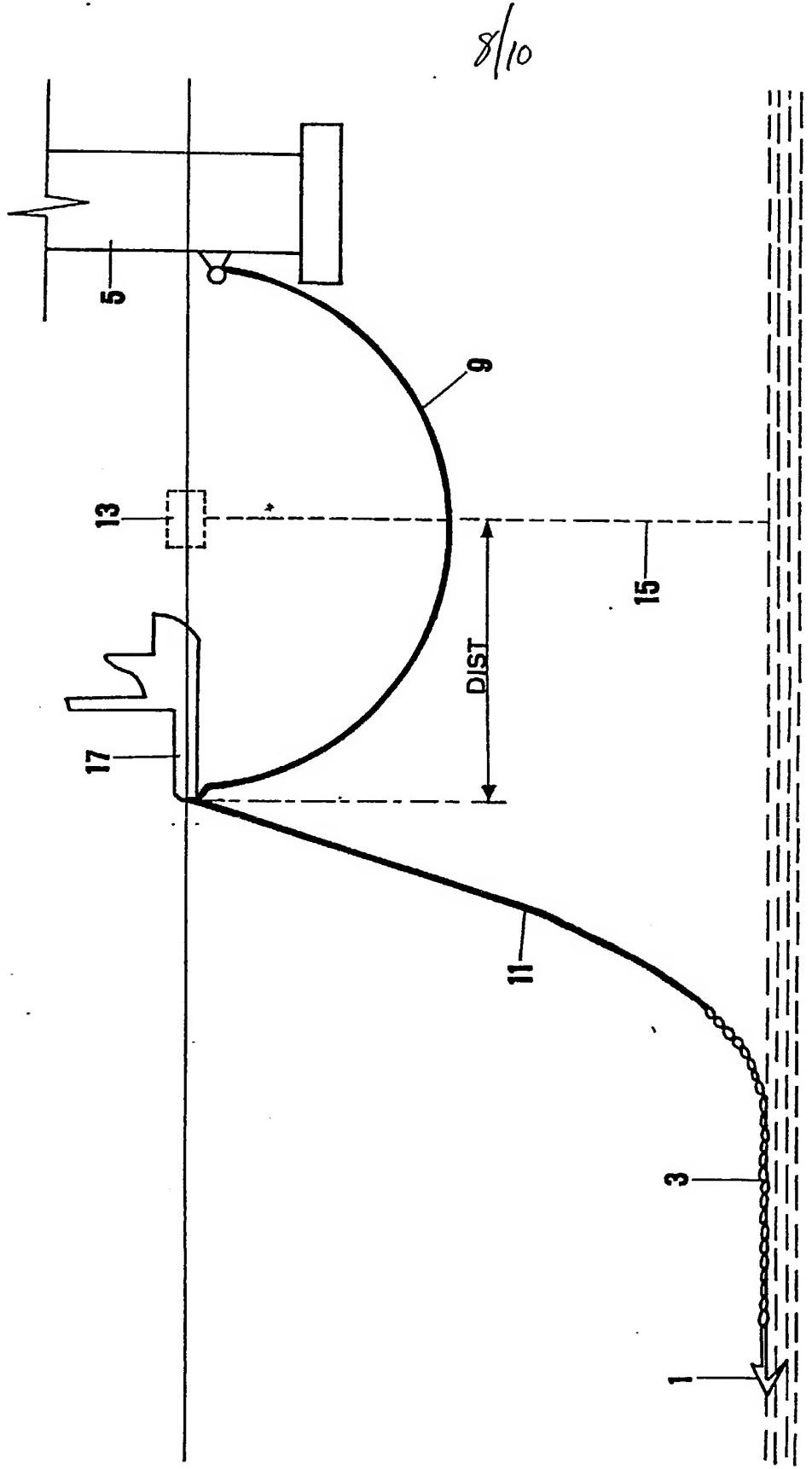


FIG 8

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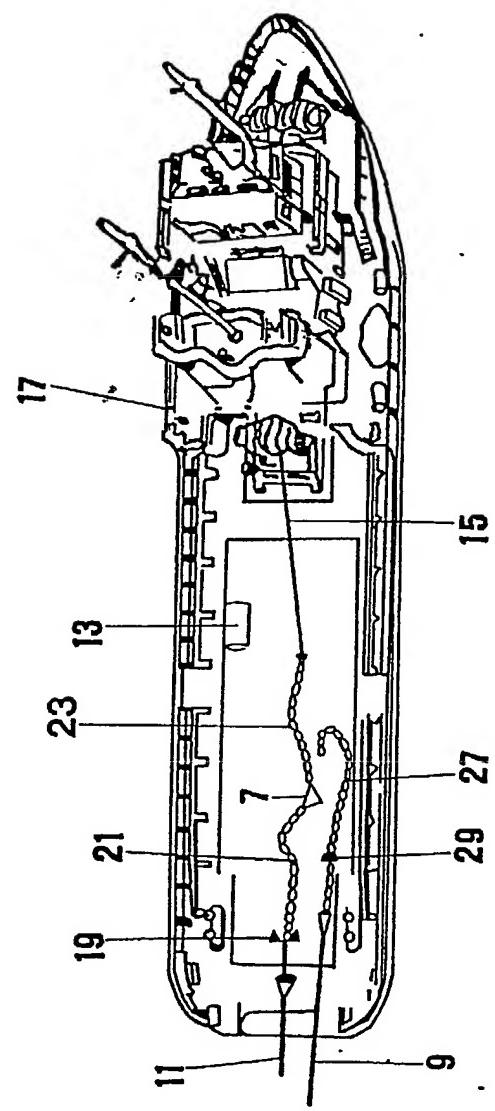
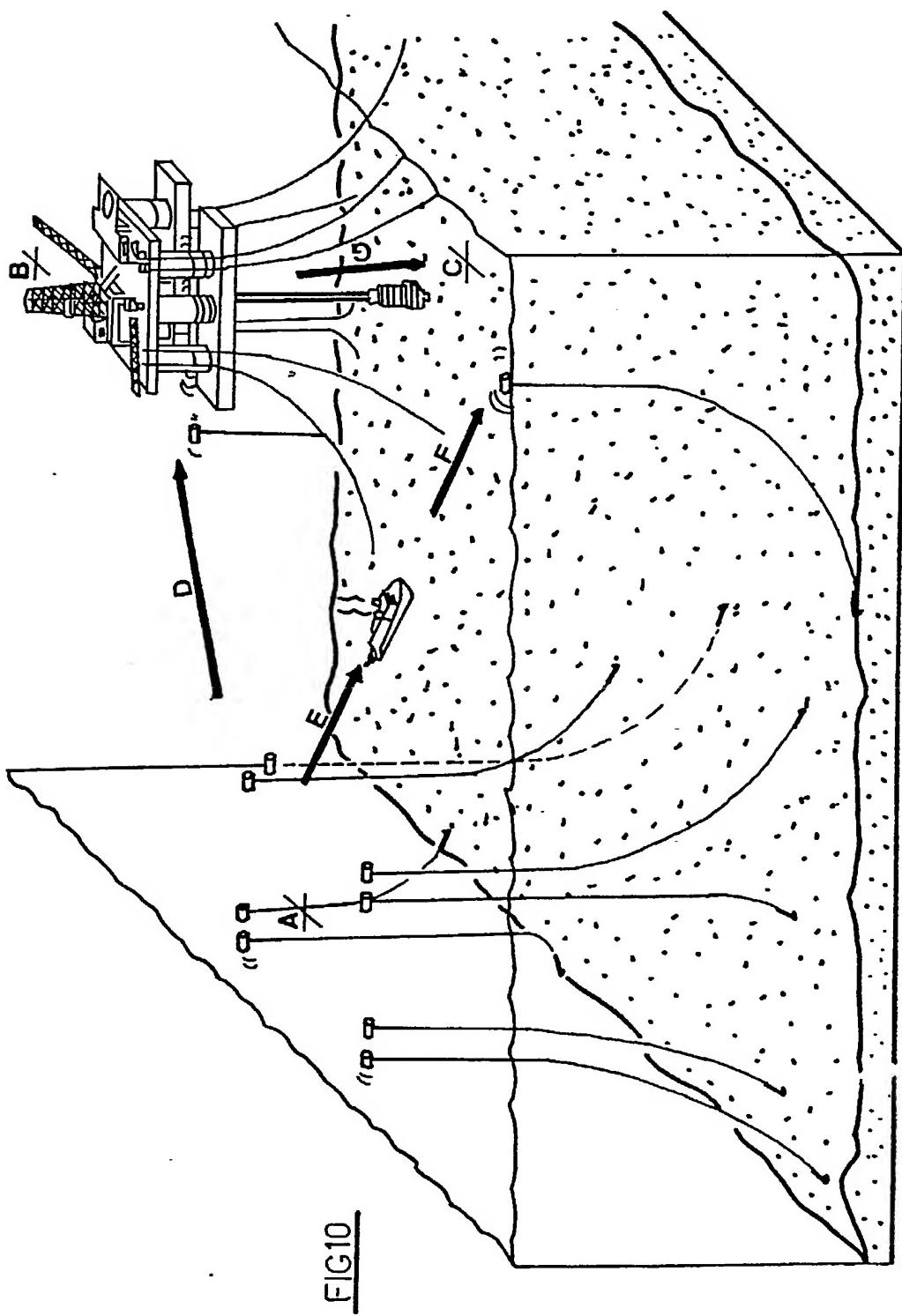


FIG 9

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ANCHORING SYSTEM FOR A SEMISUBMERSIBLE PLATFORM  
AND PROCESS FOR CASTING SUCH ANCHORING SYSTEM

This invention relates to an anchoring system for a semisubmersible or other similar platform, and to the operating process for casting an anchoring system prior to the arrival of the platform at the site. Such an operation is referred to as precasting and may be performed in water depths of up to 1,000 m, allowing for a smaller percentage of simultaneous utilisation of tug boats (RAS) appropriate for the anchor handling and supply, since the anchoring lines must be cast one at a time, several days prior to the arrival of the platform at the site, in order to lead to a more rational RAS scheduling.

It is an object of this invention to be able to intercalate the casting of the lines in different regions without damage to the casting operation.

The conventional anchoring systems are arranged so that their casting operations present major disadvantages such as:-

the high percentage of simultaneous tug boat utilisation, since the anchoring lines are laid as the platform arrives at the location, and it is not possible to provide a more rational tug boat schedule;

the fact that the platform positioning operation is carried out during long periods of time, often taking as much as ten days for the performance of such operation; and

25 the necessity of utilising workwire (cable) of large diameter and considerable length, which renders impracticable the utilisation of most presently built tug boats, due to their limited capacity of cable and mooring line storage.

It is therefore an object of this invention to provide an anchoring system for semisubmersibles or similar platforms which eliminates the inconveniences of the prior art precasting operation.

According to a first aspect of this invention, there is provided an anchoring system for a semisubmersible or similar platform, wherein each anchoring line includes:-

at least one anchor;

a mooring line, connected at one of its ends to said anchor and at its other to an anchoring cable intended to extend to the surface to be connected to a said semisubmersible

platform, said anchoring cable presenting along its extent near its central portion a triple-connection device which divides the anchoring cable into a main anchoring cable and a precast anchoring cable; and

- 5        a floating device to be attached to said triple-connection device by means of a pendant-line.

According to a second aspect of this invention, there is provided a process for precasting the anchoring system for a semisubmersible or similar platform, and including the steps 10 of:-

(a) casting an anchor by means of a tug boat at the setting site established in the anchoring plan, said anchor being set by means of a mooring line;

(b) connecting and laying an anchoring cable;

- 15        (c) attachment of the socket of said anchoring cable to the shark-jaw of said tug boat;

(d) attachment of said triple-connection to the socket of said anchoring cable;

- 20        (e) starting the casting of a pendant-line for a floating device, with said pendant-line already connected to said triple-connection device;

(f) connection of said floating device to the end of said pendant-line and casting of said floating device in the water; and

- 25        (g) returning said tug boat to the storage site of the materials for the next successive anchoring line, and casting of the succeeding anchors by the same procedure.

In order that the present invention may more readily be understood the following description is given, merely by way 30 of example, with reference to the accompanying drawings, in which:-

Figure 1 is a schematic view of one embodiment of the anchoring system for a semisubmersible platform, according to this invention;

- 35        Figure 2 is an illustrative view of part of the anchoring system of this invention;

Figure 3 is a schematic view of the precast anchoring system;

Figure 4 is an illustrative view of the triple-connection

device;

Figure 5 is an illustrative view of a tug boat utilised in the operation for precasting the anchoring system, showing the triple-connection device complete with two sections of 5 mooring line appropriate for connection to the anchoring cable and to the pendant-line;

Figure 6 is a schematic view showing the operation for positioning the platform at the desired place;

Figure 7 is an illustrative view of a tug boat utilised 10 in the platform-positioning operation, showing the main shark-jaw installed at the longitudinal centre line of the vessel and the provision of a second lateral shark-jaw or pelican for the purposes of receiving the end of the anchoring cable;

Figure 8 is a schematic view showing the tug boat running 15 towards the floating device for further shortening of the pendant-line;

Figure 9 is an illustrative view of a tug boat utilised in the platform-positioning operation, showing the attachment of the mooring line section at the shark-jaw after the arrival 20 of the triple-connection device at the deck; and

Figure 10 is an illustrative view showing a precasting schedule consisting of the previous casting of eight anchors at a given place.

As shown in Figures 1 and 2, one embodiment of the 25 anchoring system of this invention includes:

- at least one anchor 1;
- a mooring line 3 which is connected at one of its ends to the anchor 1 and at the other end to an anchoring cable 9, 11 which extends to the surface and is connected to the 30 semisubmersible platform 5. The anchoring cable 9, 11 has along its extent, near its central section, a triple-connection device 7 which divides the anchoring cable into a main anchoring cable 9 and a pre-cast anchoring cable 11; and
- a floating device 13 arranged at the surface and 35 connected to said triple-connection device 7 by means of a pendant-line 15.

The main anchoring cable 9 is stored in the anchoring winch of the platform 5, and the pre-cast anchoring cable 11 is part of the section pre-cast at the site prior to the arrival

of the platform 5.

After the tug boat has received from a storage location the materials required, the process for pre-casting the anchoring system includes the following steps:

- 5       (a) casting the anchor 1 by means of the tug boat 17 (Figure 5) at the setting place established in the anchoring plan, and setting the anchor by means of the mooring line 3;
- 10      (b) connection and casting of the anchoring cable 11;
- 10      (c) attachment of the socket of the anchoring cable 11 to the shark-jaw 19 on the tug boat;
- 15      (d) connection of the triple-connection device 7, already provided with sections 21, 23 of mooring line to the socket of the anchoring cable 11;
- 15      (e) connection of the pendant-line 15 to the mooring line 23 of the device 7 to start the casting of the pendant-line 15, it being observed that the cable 11 must be cast as near vertically as possible;
- 20      (f) connection of the floating device 13 to the upper end of the pendant-line 15 and casting of the floating device 13 in the water; and
- 25      (g) return of the tug boat 17 to the material storage location and repeat of steps (a) to (f) for the next successive anchoring line, and later for the casting of the other anchors by the same procedure.

It must be pointed out that in the pre-cast anchoring system shown in Figure 3, the anchoring cable has a total length of nearly 2,000 m, and the length of mooring line is equal to nearly 1,200 m. Moreover, in the steps of the above 30 described pre-casting method the following considerations apply:-

in step (a), the casting of the anchor 1 effected by the mooring line 3 is assisted by a supply boat (DSV), and in determining the anchor-position a margin must be left for the 35 anchor to bite, depending on the type of soil and on the anchor;

in step (b), the tug boat 17 must release the cable continuously while it moves towards the planned location, it being necessary at the same time to take care that the running

speed of the anchoring cable 11 is consistent with the displacement of the tug boat 17;

in step (d) the triple-connection device 7, of triangular shape and provided with holes 25 at its corners as shown on Figure 4 (and known by the experts in the art as a delta-plate), must be shipped in the tug boat 17 together with two sections 21, 23, of mooring lines appropriate for connection to the anchoring cable 11 and to the pendant-line 15, as may be seen in Figure 5; and

10 in step (f), the floating device 13 should include a cylindrical buoy with nearly 19 tons of buoyancy thrust.

In the operation for positioning the platform, the semisubmersible platform 5 will be held in place by means of two tug boats, while a third tug boat 17 receives the end of 15 the main anchoring cable 9 from the platform 5 and takes it to the floating device 13 shortening same, and thereafter shortening the pendant-line 15 for connecting the two sections 9, 11 of anchoring cable to the triple-connection device 7, as shown in Figure 6.

20 The positioning of the platform 5 at the desired location includes the following steps:

- (a) receipt of the end of the main anchoring cable 9 connected at its end to a section 27 of mooring line (Figure 7) in the lateral shark-jaw or pelican 25 29 on the tug boat 17, and attaching to the pelican 29 the section 27 of mooring line;
- (b) displacing the tug boat 17 towards the floating device 13, drawing in the floating device 13, and starting the shortening of the pendant-line 15;
- 30 (c) after the arrival of the triple-connection device 7 at the deck of the tug boat 17, attaching its section 21 of mooring line to the shark-jaw 19 and connecting to the triple-connection device 7 the other section 27 of mooring line (which is connected to the main anchoring cable 9 of the platform 5);
- (d) beginning the laying of the pendant-line 15 by means of the tug boat 17;
- (e) casting the triple-connection device 7 by means of

the tug boat 17 while simultaneously drawing in; at the platform 5, the additional meters of the main anchoring cable 9; and

- 5 (f) connecting the floating device 13 to the pendant-line 15 and casting it in the water.

Moreover, in the positioning of the platform by the steps explained above, the following considerations apply:-

10 in step (b), after drawing in the floating device 13 and starting the shortening of the pendant-line 15, the platform 5 must supply nearly 1,800 m of anchoring cable of the first anchoring line to be connected;

15 in addition, with the purpose of working with low tension in the pendant-line 15, the position of the tug boat 17 must be altered during the shortening of the pendant-line 15, leaving the rest position of the floating device 13 and reaching a distance indicated as "DIST" on Figure 8, which is a function of the length of the main anchoring cable 9 cast, bearing in mind that the tug boat 17 will 20 not have any machines in operation and that equilibrium will exist between the two horizontal components.

Furthermore, for the sake of illustration, Figure 10  
25 shows a precasting program consisting of the prior casting of eight anchors at a given site for receiving the platform 5 as soon as operation at the preceding well has been completed. The anchors are cast by the tug boats with a portable radio location system (syledis) installed on board, for the correct  
30 casting of the anchors in scheduled positions. The anchors are pre-tested by the tug boats themselves with the aid of the workwire (cable) installed in the towing winch. In this way most problems usually faced in conventional anchoring, such as anchor recasting, anchor sliding, piggy-back anchor installation,  
35 and buoyage of obstacles, will have been previously solved by the anchor-handling tug boats, thus saving time and boats.

As can be inferred from Figure 10, let A, B and C be three locations which are to be drilled or completed, in this

order, by a given platform 5. The operations at location A are performed and the precast system is temporarily abandoned at A, while the platform drills or completes at location B. At location B there is also in operation a precast system which 5 was connected to the anchoring lines of the platform, during its displacement from location A to location B, along path D.

While the platform 5 is operating at location B, during the availability of the anchor-handling tug boats, the precast system from location A is removed and transferred along path E 10 to be installed at location C. For arranging of the precast system at location C, the anchor-handling tug boat will have a portable radio location system installed on board to perform the casting of the anchors in a safe manner, without obstacles in its casting path. Anchor pre-testing can be conducted 15 during the occasion of precasting, by means of the tug boat equipped with workwire (cable). As the drilling or completion operations at location B are finished, the tug boats disconnect the anchoring lines from the precast system, abandon temporarily the precast system at location B, and tow the platform 5 20 along path G to location C, where a precast system of anchors is already installed for connection to the respective anchoring lines of the platform. The precast system temporarily abandoned at location B can then be removed and installed at a future site to prepare for the arrival of another platform at 25 that site.

The advantages of the 8-anchor precast system explained above are, namely:-

- a) the anchor casting/weighing speed;
- b) the non-necessity, during connection of the precast system to the anchoring line of the platform, of maintaining the platform positioned on the site;
- c) the non-necessity of conducting anchor recasting;
- d) the reduction in the waiting time of the platform because of other rigs in DMM;
- e) reduction in the number of tug boats required for the operation;
- f) reduction in the consumption (cost) of pendant-line due to the reduction in the load applied to same; and

- g) greater safety in the operations, since the connections can be made with tensionless anchoring lines, etc.

C L A I M S

1. An anchoring system for a semisubmersible or similar platform, wherein each anchoring line includes:-

at least one anchor;

5 a mooring line, connected at one of its ends to said anchor and at its other to an anchoring cable intended to extend to the surface to be connected to a said semisubmersible platform, said anchoring cable presenting along its extent near its central portion a triple-connection device which divides 10 the anchoring cable into a main anchoring cable and a precast anchoring cable; and

a floating device to be attached to said triple-connection device by means of a pendant-line.

2. An anchoring system according to claim 1, wherein 15 said triple-connection device is provided with two sections of mooring line suitable for connection respectively to said precast anchoring cable and said pendant-line.

3. An anchoring system according to claim 1 or 2, wherein said floating device includes a cylindrical buoy.

20 4. A process for precasting the anchoring system for a semisubmersible or similar platform, and including the steps of:-

(a) casting an anchor by means of a tug boat at the setting site established in the anchoring plan, said anchor 25 being set by means of a mooring line;

(b) connecting and laying an anchoring cable;

(c) attachment of the socket of said anchoring cable to the shark-jaw of said tug boat;

(d) attachment of said triple-connection to the socket 30 of said anchoring cable;

(e) starting the casting of a pendant-line for a floating device, with said pendant-line already connected to said triple-connection device;

(f) connection of said floating device to the end of 35 said pendant-line and casting of said floating device in the water; and

(g) returning said tug boat to the storage site of the materials for the next successive anchoring line, and casting of the succeeding anchors by the same procedure.

5. A process according to claim 4, wherein, in step (a), the casting of said anchor effected by means of said mooring line is assisted by a supply boat; and wherein, when determining the position of said anchor, a margin is provided 5 for said anchor to bite, depending on the type of soil and on the anchor.

6. A process for precasting the anchoring system for a semisubmersible or similar platform, according to claim 4 or 5, wherein, when positioning the platform, said tug boat 10 receives the end of a main anchoring cable of said platform and takes it to said floating device, the main anchoring cable is then shortened and thereafter said pendant-line is shortened and the connections of said anchoring cable and main anchoring cable to said triple-connection device are made.

15 7. A process according to claim 6, wherein positioning of the platform includes the following steps:-

(a) receipt of the end of said main anchoring cable, connected at its end to a section of mooring line, to the lateral shark-jaw or pelican at said tug boat, said section of 20 mooring line being attached to said shark-jaw;

(b) displacement of said tug boat towards said floating device and shortening of said pendant-line;

(c) after the arrival of said triple-connection device at the deck of said tug boat, attaching said section of mooring 25 line to said shark-jaw to make the connection of said section of mooring line to said triple-connection device;

(d) beginning the laying of said pendant-line by means of said tug boat;

(e) casting of said triple-connection device by means 30 of said tug boat with the simultaneous shortening, at said platform of additional meters of said main anchoring cable; and

(f) connection of the triple-connection device to the pendant-line and casting of said floating device in the water.

35 8. A process according to any one of claims 4 to 7, wherein said connection of the pendant-line to the triple connection device is by way of a section of mooring line already attached to said triple-connection device.

9. An anchoring system for a semisubmersible or similar

platform, constructed and arranged to be used substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawings.

10. A process of pre-casting the anchoring system of a submersible or similar platform substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawings.

Patents Act 1977  
Examiner's report to the Comptroller under  
Section 17 (The Search Report)

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Relevant Technical fields

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5 B63B

(ii) Int CI (Edition )

Search Examiner

B J PRICE

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASES: WPI

Date of Search

28 SEPTEMBER 1992

Documents considered relevant following a search in respect of claims 1 TO 8

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	WO 85/01713 A1 (SONAT) see Figure 4	1
X	US 4067282 (GUINN) see link 14	1

Category	Identity of document and relevant passages	Relevance to claim(s)

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